CLAIMS:

I claim:

1. A method of rapid identification of transmission media channel characteristics, comprising:

generating a training sequence;

transmitting the training sequence as an input to the channel;

obtaining an output quantity of the channel related to the transmitted training sequence and an unknown impulse response of the channel;

computing a known quantity from the training sequence; and

decoupling the training sequence from the output quantity for computing an estimate of the impulse response of the channel.

2. The method of claim 1, further comprising using the estimate of the impulse response to remove impairments imposed by the transmission media channel on received signals.

3. The method of claim 1, wherein the computing the estimate of the impulse response comprises a convergence technique.

4. The method of claim 1, wherein the training sequence comprises a known training sequence.

5. The method of claim 1, wherein the computing the estimated impulse response comprises computing an initial estimate of the impulse response.

6. The method of claim 1, further comprising fine-tuning the estimated impulse response using standard convergence techniques.

7. The method of claim 1, wherein the computing the estimated impulse response comprises operating the known quantity on the output quantity.

8. The method of claim 1, wherein the known quantity is computed off-line.

9. The method of claim 1, wherein the known quantity comprises a matrix $M = \left(\overline{X}X\right)^{-1}\overline{X}$, where X is the training sequence in matrix form, and $\overline{X}$ is the Hermitian of X.

10. The method of claim 1, wherein the computing the estimate of the impulse response of the channel is hardware implemented.

11. The method of claim 1, wherein the computing the estimate of the impulse response of the channel is software implemented.

12. The method of claim 1, further comprising using the estimate of the impulse response of the channel for removing echoes from received signals from the channel.

13. The method of claim 1, further comprising using the estimate of the impulse response of the channel for setting the coefficients of a filter.

14. The method of claim 1, further comprising using the estimate of the impulse response of the channel for setting the coefficients of an echo canceller.

15. The method of claim 1, further comprising using the estimate of the impulse response of the channel for setting the coefficients of an equalizer.

16. A method of rapid identification of transmission media channel characteristics, comprising:

generating a training sequence;

convolving the training sequence with an unknown impulse response representation of the transmission media channel to form a computed output signal of the channel;

minimizing a difference between an observed or measured output signal of the channel and the computed output signal of the channel;

using the minimized difference, the training sequence, and the observed or measured output signal for computing an estimated impulse response of the channel.

17. The method of claim 16, wherein the using the minimized difference, the training sequence, and the observed or measured output signal for computing an estimated impulse response of the channel comprises using a known quantity related to the training sequence that can be expressed as a matrix $M = \left(\overline{X}X\right)^{-1}\overline{X}$, where X is the training sequence in matrix form, and $\overline{X}$ is the Hermitian of X.

18. The method of claim 17, further comprising computing M off-line from communications with the transmission media channel.

19. The method of claim 16, wherein the using the minimized difference, the training sequence, and the observed or measured output signal to compute the estimated impulse response of the channel comprises decoupling the training sequence from the output signal for computing the estimated impulse response of the channel.

20. The method of claim 16, further comprising using the estimated impulse response to remove impairments imposed by the transmission media channel on received signals.

21. The method of claim 16, further comprising fine-tuning the estimated impulse response using standard convergence techniques.

22. The method of claim 16, wherein the computing the estimated impulse response comprises a convergence technique.

23. The method of claim 16, further comprising using the estimated impulse response of the channel for setting the coefficients of a filter.

24. The method of claim 16, further comprising using the estimated impulse response of the channel for setting the coefficients of an echo canceller.

25. The method of claim 16, further comprising using the estimated impulse response of the channel for setting the coefficients of an equalizer.

26. A system for rapid identification of transmission media channel characteristics, comprising:

a processor adapted to execute code to:

generate a training sequence;

transmit the training sequence as an input to the channel;

obtain an output quantity of the channel related to the transmitted training sequence and an unknown impulse response of the channel;

compute a known quantity from the training sequence; and

decouple the training sequence from the output quantity to compute an estimate of the impulse response of the channel.

27. The system of claim 26, wherein the processor comprises a DSP.

28. The system of claim 26, wherein the processor comprises a CPU of a computer.

29. The system of claim 26, further comprising a modem coupling the processor to the transmission media channel.

30. The system of claim 26, wherein the processor forms part of a communications system.

31. The system of claim 26, wherein processor forms part of a modem.

32. The system of claim 26, further comprising a hybrid coupling the processor to the transmission media channel.

33. The system of claim 26, wherein the processor is adapted to execute code to compute a matrix $M = \left(\overline{X}X\right)^{-1}\overline{X}$ off-line from the transmission media channel, and wherein X is the training sequence in matrix form, and $\overline{X}$ is the Hermitian of X.

34. The system of claim 26, further comprising a hybrid coupling the processor to the transmission media channel.

35. The system of claim 26, wherein the processor is adapted to use the estimate of the impulse response to remove impairments imposed by the transmission media channel on received signals.

36. The system of claim 26, further comprising a filter adapted to remove channel impairments from received signals from the channel using the estimate of the impulse response.

37. The system of claim 26, wherein the filter comprises an echo canceller for removing echo signals.

38. The system of claim 26, wherein the filter comprises an equalizer whose output is equalized for gain and phase.

39. A system for rapid identification of transmission media channel characteristics, comprising:

a processor for executing code for generating a training sequence, the training sequence transmitted as an input to the channel;

a communications system coupling the processor to the channel, the processor executing the code to:

obtain an observed or measured output quantity of the channel related to the transmitted training sequence and an unknown impulse response of the channel,

compute a known quantity from the training sequence,

decouple the training sequence from the output quantity, and

compute an estimate of the impulse response of the channel; and

a disk storage medium for providing the code to the processor.

40. The system of claim 39, wherein the processor comprises a DSP.

41. The system of claim 39, wherein the processor comprises a CPU of a computer.

42. The system of claim 39, further comprising a modem coupling the processor to the transmission media channel.

43. The system of claim 39, wherein the processor forms part of a communications system.

44. The system of claim 39, wherein processor forms part of a modem.

45. The system of claim 39, further comprising a hybrid coupling the processor to the transmission media channel.

46. The system of claim 39, wherein the processor executes code to compute a matrix $M = \left(\overline{X}X\right)^{-1}\overline{X}$ off-line from the transmission media channel, and wherein X is the training sequence in matrix form, and $\overline{X}$ is the Hermitian of X.

47. The method of claim 39, wherein the estimate of the impulse response is computed in a hardware implementation.

48. The method of claim 39, wherein the estimate of the impulse response is computed in a software implementation.

49. The system of claim 39, wherein the processor is adapted to use the estimate of the impulse response to remove impairments imposed by the transmission media channel on received signals.

50. The system of claim 39, further comprising a filter adapted to remove channel impairments from received signals from the channel using the estimate of the impulse response.

51. The system of claim 39, wherein the filter comprises an echo canceller for removing echo signals.

52. The system of claim 39, wherein the filter comprises an equalizer whose output is equalized for gain and phase.